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SOME PINEAPPLE PROBLEMS.

7th ARTICLE. - FERTILIZING.

By Henry C. Henricksen.

PLANT NUTRIENTS. - A plant nutrient is any element that enters into a plant and that is found to be necessary for that plant's normal development. In most plants elements are frequently found which are not necessary; in fact, they may be harmful, but they are there because the plant has not reached the stage of development where it can reject them. Therefore, an adequate discussion of plant nutrients should include all the elements that may be found in a soil regardless of whether they are beneficial or not. In this investigation a study of the effect of the more common soil elements upon the pineapple plant is contemplated, but at this time only the so-called fertilizer elements will be discussed although other elements with which they are usually combined will have to be mentioned.

FERTILIZING. - Most agricultural soils are supposed to contain enough of the various plant nutrients except nitrogen, potassium and phosphorus, to supply the needs of agricultural crops. These elements in combination with others are, therefore, applied when needed and such application is termed fertilizing. The main questions in regard to fertilizing are: What forms, combination and quantities of nitrogen, potassium and phosphorus are best suited for pineapples and when should they be applied?

QUANTITY OF FERTILIZERS. - The two outstanding facts in regard to this question are: Pineapples need a great deal of fertilizer and it pays to fertilize. This conclusion is not based upon data from fertilizer experiments so much as upon field experience in general. Small fertilizer experiments are not usually satisfactory, which is but natural, considering that the pineapple plant is very sensitive to soil conditions and that it is difficult to find uniform soil in which to conduct an experiment. General field experience, on the other hand, is reliable, provided all the factors are known and proper allowance is made for them when comparing the result from one field with that of another. Such comparisons show that when the content of water soluble nitrogen is 50 mg. per kg. of soil the plant growth is satisfactory whereas if it is much below that the growth is accelerated by an application of nitrogen.

Likewise, when the content of potassium that can be extracted from a soil with water or with 1% citric acid is 100 mg. per kg. soil, the supply of that is sufficient, whereas with a much smaller content the plants are benefited by an application of potash. These figures are, of course, not applicable within narrow limits, but with a liberal allowance for other disturbing factors they can be used as a basis until more data becomes available.

SOIL ANALYSIS. - Chemical analytical work is seldom undertaken by the planter himself; therefore, when he wants to avail himself of it he must engage the service of a chemist. The questions are what information is essential and how much is it worth? The answer is: An analysis of the soil itself is not usually essential and in this case







it is not worth what it costs. A knowledge of the amounts of readily soluble nitrogen and potash in the soil is essential at times and it is usually worth what the chemist charges, for such an analysis is not very costly. A phosphate determination may also be essential, but sufficient data regarding that question is not yet available. In this investigation a comparison of plants grown on soils with widely different phosphate content has given no definite information.

The next question is when should a pineapple soil be analyzed? That can not be answered off-hand but the following examples will help to answer the question. -- Example 1. - A field that has produced no crop for many years, except shrubbery or pasture, is planted to pineapples. When should that field be fertilized, with what and how much? An analysis of the soil about a month after planting may, in this case, save a planter considerable money, for under such conditions enough nutrients may be present to supply the plants for some time. Example 2. - A field that has produced sugar cane or pineapples followed by a crop of legumes is planted to pineapples. In this case an analysis is not usually necessary. Such a field needs fertilizing without question and it most probably needs nitrogen and potash in the usual proportions. Example 3. - A field is fertilized and a few days after several inches of rain falls. To what extent did the rain wash or leach the fertilizers away? The washing can be estimated by an intelligent observer, but the extent of the leaching cannot be estimated except the retentivity of the soil is known. A chemical analysis will answer the question of immediate importance and it will also furnish a basis upon which to form an estimate in the future.

SOIL SAMPLING. - Samples are taken with a soil auger to the depth reached by the plow when the land was prepared, which is seldom more than six to eight inches in pineapple fields in Porto Rico. Twelve or more borings are made in pineapple beds in which the soil shows uniformity. The composite sample is spread out to dry and after it is air dry it is well mixed. About a pound of the air dry soil is all the chemist will need.

METHODS OF ANALYSIS. - A water extraction has been found to be generally satisfactory. Fifty grams air dry, pulverized soil, is shaken with 500 cc water for 30 minutes after which it is filtered. The ammonia is determined in the filtrate by Nesslerizing. - With a clay soil, containing much ammonia, it may be advisable to extract with a 10% potassium chloride solution and the ammonia determined by distillation and titration in the usual manner. Nitrate nitrogen can be satisfactorily recovered by a water extraction and determined by the phenol-disulphonic acid method. Most of the potash in a sandy soil can be recovered by water extraction, but with a clay soil, from an old pasture, it may be advisable to extract with a 1% citric acid solution. The potash may be determined in the filtrate by one of the methods described in bulletin No. 31 Bureau of Soils, United States Department of Agriculture, or by any other method that is suitable and cheap. The chemist must keep strictly in mind that these determinations must be cheap and that the terms used in reporting results must be readily understandable. If these two conditions are not complied with the planter will not pay for the analysis nor will he make use of the results.



